IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

INVENTORS:	Roufoogaran, et al.		
DOCKET NO.:	BP3274		
SERIAL NO.	10/802,014	**GROUP ART UNIT:**	2618
FILED:	March 16, 2004	**EXAMINER:**	Pablo N. Tran
SUBJECT:	Radio Front End and Applications Thereof		

APPEAL BRIEF

M/S Appeal Briefs – Patents
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

This Appeal Brief is respectfully submitted in connection with the above-identified application in response to the final rejection mailed August 22, 2008 (Final Office Action) and the Notice of Panel Decision from Pre-Appeal Brief Review mailed March 6, 2009. Appellant timely filed a Notice of Appeal on October 24, 2008.

1.0 Real Party in Interest

The real party in interest is Broadcom Corporation, the assignee of record.

2.0 Related Appeals and Interferences

There are no other prior or pending related appeals, interferences or judicial proceedings of the claims in this case. A Petition from Requirement of Restriction filed April 12, 2007 in this case is still pending without a decision.

3.0 Status of the Claims

1. Rejected – appealed in this brief.
2. Objected to and indicated as Allowable.
3. Withdrawn.
4. Withdrawn.
5. Withdrawn.
6. Rejected – appealed in this brief.
7. Withdrawn.
8. Withdrawn.
9. Withdrawn.
10. Withdrawn.
11. Withdrawn.
12. Withdrawn.
13. Withdrawn.
14. Withdrawn.
15. Withdrawn.
16. Rejected – appealed in this brief.
17. Objected to and indicated as Allowable.
18. Withdrawn.
19. Withdrawn.

20. Withdrawn.
21. Rejected – appealed in this brief.
22. Withdrawn.
23. Withdrawn.
24. Withdrawn.
25. Withdrawn
26. Withdrawn.
27. Withdrawn.
28. Withdrawn.
29. Withdrawn.
30. Withdrawn.

4.0 Status of Amendments

No amendments have been filed subsequent to the final rejection of the claims that are the subject of this appeal. A Petition from Requirement of Restriction filed April 12, 2007 in this case is still pending without a decision.

5.0 Summary of the Claimed Subject Matter

Please find below a concise explanation of the subject matter defined in each of the four pending claims subject to this appeal.

5.1 Independent claim 1

The description of embodiments of Claim 1 below include citations from corresponding U.S. Published Application No. 2005/0208917. Independent claim 1 describes a radio front end (See Figure 2, Ref. 85 and Figures 3 through 9 and description of operation at paragraphs 31 and 32), comprising:

a transformer (See, e.g., Figures 3 through 8, transformer 100 and Figure 9, transformer 101 and general description at paragraph 35) having a first winding (See, e.g., Figures 3 through 8, 1st Winding 102, and Figure 9, 1st Winding 103 and description at paragraph 35) and a second

winding (See, e.g., Figures 3 through 8, 2nd Winding 104, and Figure 9, 2nd Winding 105 and description at paragraphs 35 and 36), wherein the first winding is operably coupled to an antenna (See, e.g., Figures 3 through 9, Ref 86 and description at paragraph 35) and the second winding coupled to at least one of a power amplifier (See, e.g., Figures 3, 4 and 9, Ref. 84 and description at paragraphs 35 and 36) and a low noise amplifier (See, e.g., Figures 3, 4 and 9, Ref. 72 description at paragraphs 35 and 36); and

an adjustable load operably coupled to the second winding (See, e.g., Figures 3, 5 through 8, adjustable load 106 and Figure 9, adjustable load 112-118 and description at paragraphs 35 and 36), wherein the adjustable load provides a first impedance based on a first impedance selection signal when the radio front end is in a transmit mode (See, e.g., Figures 3, 5 through 8, impedance selection signal 108 and description at paragraphs 35 and 36) and provides a second impedance based on a second impedance selection signal when the radio front end is in a receive mode (See, e.g., Figures 3, 5 through 8, impedance selection signal 108 and description at paragraphs 35 and 36) such that impedance at the first winding is substantially similar in the transmit mode and in the receive mode (See, e.g., description paragraphs 35 and 36).

In an embodiment, as described e.g. in paragraphs 35 and 36 of corresponding U.S. Published Application No. 2005/0208917, a radio front-end (e.g., Radio Front-End 85 in Figures 2 through 9) includes a transformer (e.g., Figures 3 through 8, transformer 100 and Figure 9, transformer 101) and an adjustable load 106 (See, e.g., Figures 3, 5 through 8, adjustable load 106 and Figure 9, adjustable load 112-118). The transformer includes a 1st winding (e.g., Figures 3 through 8, 1st Winding 102, and Figure 9, 1st Winding 103) and a 2nd winding (e.g., Figures 3 through 8, 2nd Winding 104, and Figure 9, 2nd Winding 105). The 1st winding may be a single-ended winding operably coupled to a circuit ground and to an antenna 86 (See, e.g., Figures 3 through 9, Ref 86). The 2nd winding may be a differential winding having a center tap coupled to circuit ground and the other nodes coupled to the adjustable load. The adjustable load is adjusted based on an impedance selection signal (See, e.g., Figures 3, 5 through 8, impedance selection signal 108) and is coupled to a low noise amplifier (See, e.g., Figures 3, 4 and 9, Ref. 72) and a power amplifier (See, e.g., Figures 3, 4 and 9, Ref. 84). The adjustable load provides a 1st impedance based on the impedance selection signal when the radio front-end is in a transmit mode (i.e., the power amplifier is enabled and low noise amplifier is disabled) and provides a 2nd

impedance based on the impedance selection signal when the radio front-end is in a receive mode (i.e., the power amplifier is off and the low noise amplifier is on) such that the impedance on the 1st winding is substantially similar in the transmit mode and in the receive mode of the radio (See, e.g. description at paragraphs 35 and 36).

5.2 Dependent Claim 6

The description of embodiments of Claim 6 below include citations from corresponding U.S. Published Application No. 2005/0208917. Dependent claim 6 describes determining the load impedance selection signal (See, e.g., Figures 3, 5 through 8, impedance selection signal 108 and description at paragraphs 35 and 36) based on at least one of: impedance matching of load on single-ending winding(See, e.g. paragraph 36), output power requirements (See, e.g., Figures 3, 4 and 9, Ref. 84), and receiver sensitivity (See, e.g., Figures 3, 4 and 9, Ref. 72).

In an embodiment, as described e.g. in paragraph 36 of corresponding U.S. Published Application No. 2005/0208917, the loading on the 2nd winding connected to the antenna varies depending on whether the power amplifier 84 is enabled or the low noise amplifier is enabled. During a calibration function of the wireless communication device, the particular loading on the 2nd winding is determined based on the power amplifier, e.g. output power and the low noise amplifier, e.g. receiver sensitivity, during the transmit and receive modes. As explained in paragraph 36, based on this determination, the impedance selection signal may be generated to provide the desired loading of adjustable load such that it provides a 1st load during transmit mode and a 2nd impedance during receive mode such that the load on the 2nd winding 104 remains substantially constant whether the radio is in a transmit mode or receive mode.

5.3 Independent Claim 16

The description of embodiments of Independent Claim 16 below include citations from corresponding U.S. Published Application No. 2005/0208917. Independent claim 16 describes a radio front end operably coupled to transceiver radio frequency (RF) signals (See, e.g., Figure 2, Ref. 85 and Figures 3 through 9 and general description of operation at paragraphs 31 and 32);

a low noise amplifier operably coupled to the radio front end, wherein the low noise amplifier receives inbound RF signals from the radio front end, and wherein the low noise

amplifier amplifies the inbound RF signals to produce amplified inbound RF signals (See, e.g., Figure 2, Ref. 72 and Figures 3 through 9 and description of operation at paragraph 32);

down conversion module operably coupled to convert the amplified inbound RF signals into inbound baseband signals (See, e.g., Figure 2, Ref. 70 and description of operation at paragraph 32);

baseband processing module operably coupled to convert the inbound baseband signals into inbound data and to convert outbound data into outbound baseband signals in accordance with a wireless communications protocol (See, e.g., Figure 2, Refs. 64, 75 and 76 and description at paragraphs 29, 30 and 33);

up conversion module operably coupled to convert the outbound baseband signals into outbound RF signals (See, e.g., Figure 2, Ref. 82 and description at paragraph 31); and

a power amplifier operably coupled to amplify the outbound RF signals to produce amplified outbound RF signals and to provide the amplified outbound RF signals to the radio front end (See, e.g., Figure 2, Ref. 84 and Figures 3 through 9 and general description of operation at paragraph 31);

wherein the radio front end includes:

a transformer (See, e.g., Figures 3 through 8, transformer 100 and Figure 9, transformer 101 and general description at paragraph 35) having a first winding (See, e.g., Figures 3 through 8, 1st Winding 102, and Figure 9, 1st Winding 103 and description at paragraph 35) and a second winding (See, e.g., Figures 3 through 8, 2nd Winding 104, and Figure 9, 2nd Winding 105 and description at paragraphs 35 and 36), wherein the first winding is operably coupled to an antenna (See, e.g., Figures 3 through 9, Ref 86 and description at paragraph 35) and the second winding coupled to at least one of a power amplifier (See, e.g., Figures 3, 4 and 9, Ref. 84 and description at paragraphs 35 and 36) and a low noise amplifier (See, e.g., Figures 3, 4 and 9, Ref. 72 description at paragraphs 35 and 36); and

wherein the adjustable load provides a first impedance based on a first impedance selection signal when the radio front end is in a transmit mode (See, e.g., Figures 3, 5 through 8, impedance selection signal 108 and description at paragraphs 35 and 36) and provides a second impedance based on a second impedance selection signal when the radio front end is in a receive mode (See, e.g., Figures 3, 5 through 8, impedance selection signal 108 and description at

paragraphs 35 and 36) such that impedance at the first winding is substantially similar in the transmit mode and in the receive mode (See, e.g., description paragraphs 35 and 36).

In an embodiment, as described e.g. in paragraphs 35 and 36 of corresponding U.S. Published Application No. 2005/0208917, a radio front-end (e.g., Radio Front-End 85 in Figures 2 through 9) includes a transformer (e.g., Figures 3 through 8, transformer 100 and Figure 9, transformer 101) and an adjustable load 106 (See, e.g., Figures 3, 5 through 8, adjustable load 106 and Figure 9, adjustable load 112-118). The transformer includes a 1st winding (e.g., Figures 3 through 8, 1st Winding 102, and Figure 9, 1st Winding 103) and a 2nd winding (e.g., Figures 3 through 8, 2nd Winding 104, and Figure 9, 2nd Winding 105). The 1st winding may be a single-ended winding operably coupled to a circuit ground and to an antenna 86 (See, e.g., Figures 3 through 9, Ref 86). The 2nd winding may be a differential winding having a center tap coupled to circuit ground and the other nodes coupled to the adjustable load. The adjustable load is adjusted based on an impedance selection signal (See, e.g., Figures 3, 5 through 8, impedance selection signal 108) and is coupled to a low noise amplifier (See, e.g., Figures 3, 4 and 9, Ref. 72) and a power amplifier (See, e.g., Figures 3, 4 and 9, Ref. 84). The adjustable load provides a 1st impedance based on the impedance selection signal when the radio front-end is in a transmit mode (i.e., the power amplifier is enabled and low noise amplifier is disabled) and provides a 2nd impedance based on the impedance selection signal when the radio front-end is in a receive mode (i.e., the power amplifier is off and the low noise amplifier is on) such that the impedance on the 1st winding is substantially similar in the transmit mode and in the receive mode of the radio (See, e.g. description at paragraphs 35 and 36).

5.4 Dependent Claim 21

The description of embodiments of dependent claim 21 below include citations from corresponding U.S. Published Application No. 2005/0208917. Dependent claim 21 describes determining the load impedance selection signal (See, e.g., Figures 3, 5 through 8, impedance selection signal 108 and description at paragraphs 35 and 36) based on at least one of: impedance matching of load on single-ending winding(See, e.g. paragraph 36), output power requirements (See, e.g., Figures 3, 4 and 9, Ref. 84), and receiver sensitivity (See, e.g., Figures 3, 4 and 9, Ref. 72).

In an embodiment, as described e.g. in paragraph 36 of corresponding U.S. Published Application No. 2005/0208917, the loading on the 2nd winding connected to the antenna varies depending on whether the power amplifier 84 is enabled or the low noise amplifier is enabled. During a calibration function of the wireless communication device, the particular loading on the 2nd winding is determined based on the power amplifier, e.g. output power and the low noise amplifier, e.g. receiver sensitivity, during the transmit and receive modes. As explained in paragraph 36, based on this determination, the impedance selection signal may be generated to provide the desired loading of adjustable load such that it provides a 1st load during transmit mode and a 2nd impedance during receive mode such that the load on the 2nd winding 104 remains substantially constant whether the radio is in a transmit mode or receive mode.

6. Grounds of Rejection to be Reveiwed on Appeal

Whether claims 1, 6, 16 and 21 are unpatentable under 35 U.S.C. 103 over U.S. Patent No. 7,065,327 to MacNally et al. (the MacNally reference) in view of U.S. Patent Publication No. 2005/0195113 to Candal (the Candal reference).

7. Argument

Rejection under 35 U.S.C. 103

An Office Action with a final rejection was mailed on August 22, 2008 (Final Office Action). The Final Office Action rejected claims 1, 6, 16 and 21 under 35 U.S.C. 103 over U.S. Patent No. 7,065,327 to MacNally et al. (the MacNally reference) in view of U.S. Patent Publication No. 2005/0195113 to Candal (the Candal reference). Appellants respectfully appeal this rejection of the claims 1, 6, 16 and 21 under 35 U.S.C. §103(a) because the Office Action has failed to provide a prima facie case of obviousness of the claims in view of the cited references for the reasons stated below.

7.1 Independent Claim 1

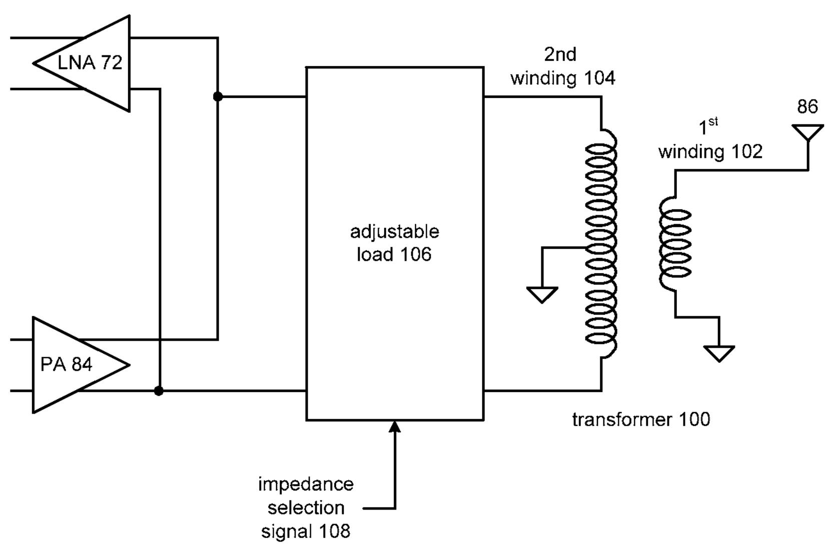
The Office Action has failed to provide a prima facie case of obviousness of claim 1 because the combination of the McNally reference and the Candal reference fails to disclose and teaches away from the elements in claim 1, *inter alia*, of, "a transformer having a first winding and a second winding, wherein the first winding is operably coupled to an antenna and the second winding coupled to at least one of a power amplifier and a low noise amplifier; and an adjustable load operably coupled to the second winding, wherein the adjustable load provides a first impedance based on a first impedance selection signal when the radio front end is in a transmit mode and provides a second impedance based on a second impedance selection signal when the radio front end is in a receive mode such that impedance at the first winding is substantially similar in the transmit mode and in the receive mode." Paragraphs 35 and 36 of corresponding U.S. Published Application No. 2005/0208917, state:

> "Figure 3 is a schematic block diagram of an embodiment of a radio front-end 85 that includes a transformer 100 and an adjustable load 106. The transformer 100 includes a 1st winding 102 and a 2nd winding 104. The 1st winding may be a single-ended winding operably coupled to a circuit ground and to an antenna 86. The 2nd winding 104 may be a differential winding having a center tap coupled to circuit ground and the other nodes coupled to the adjustable load 106. The adjustable load 106 is adjusted based on an impedance selection signal 108 and is

coupled to the low noise amplifier 72 and power amplifier 84. The adjustable load provides a 1st impedance based on the impedance selection signal 108 when the radio front-end is in a transmit mode (i.e., the power amplifier 84 is enabled and low noise amplifier 72 is disabled) and provides a 2nd impedance based on the impedance selection signal 108 when the radio front-end is in a receive mode (i.e., the power amplifier 84 is off and the low noise amplifier 72 is on) such that the impedance on the 1st winding is substantially similar in the transmit mode and in the receive mode of the radio.

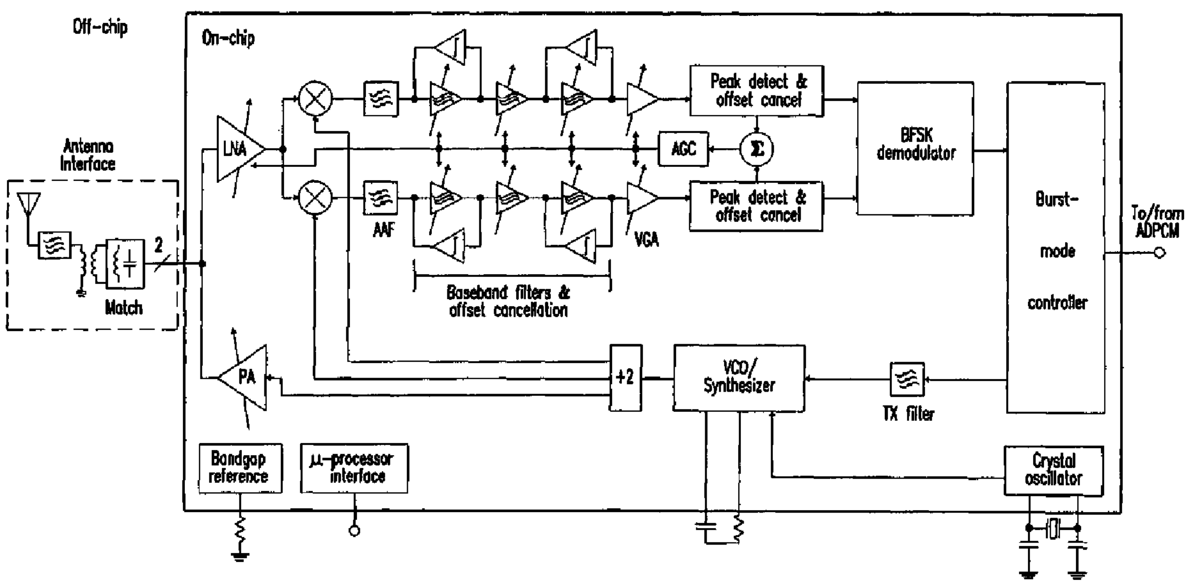
In operation, the loading on the 2nd winding 104 varies depending on whether the power amplifier 84 is enabled or the low noise amplifier 72 is enabled. During a calibration function of the wireless communication device, the particular loading during the transmit and receive modes may be determined. Based on this determination, the impedance selection signal 108 may be generated to provide the desired loading of adjustable load 106 such that it provides a 1st load during transmit mode and a 2nd impedance during receive mode such that the load on the 2nd winding 104 remains substantially constant whether the radio is in a transmit mode or receive mode."

Figure 3 of the application is reproduced below.



Combination Fails to Disclose Elements of Claim 1

The combination of the MacNally reference and the Candal reference fail to disclose the elements of claim 1. With respect to the MacNally reference, the Office Action cites Figure 1 and column 5, lines 3 through 23 as disclosing, "a transformer having a first winding and a second winding, wherein the first winding is operable coupled to an antenna and the second winding coupled to at least one of a power amplifier and a low noise amplifier, and an adjustable load operable coupled to the second winding." However, the MacNally reference nowhere discloses ***an adjustable load*** coupled to a second winding of a transformer or ***any type of impedance selection signal***. Figure 1 of the MacNally reference is resproduced below.



The Office Action argues on page 3, first full paragraph that:

> "MacNally et al. disclose such matching network with a first impedance based on a first impedance selection signal when the radio front end is in a transmit mode and provides a second impedance based on a second impedance selection signal when the radio front end is in a receive mode but not specifically such that impedance at the first winding is substantially similar in the transmit mode and in the receive mode."

However, as seen in Figure 1, the Antenna Interface shows a "Match" block with generic symbols for an inductor and a capacitor. The MacNally reference describes the Antenna

Interface at column at Column 5, lines 11 through 14 and states that the "Antenna Interface" in Figure 1 includes, "an ISM band filter 112, a balun 114, an RF matching network 116 . . .". This description and the "Match" block in Figure 1 fail to describe ***an adjustable load*** coupled to a second winding of a transformer or ***any type of impedance selection signal***. In fact, the MacNally describes at Column 6, lines 51 through 56 that the low noise amplifier (LNA) has a first impedance transformation network, seen in Figure 2, for receiving a signal while the power amplifier has a singly matched network associated with it for transmission of a signal, as seen in Figure 12. Thus, the MacNally reference fails to describe, "an adjustable load operably coupled to the second winding, wherein the adjustable load provides a first impedance based on a first impedance selection signal when the radio front end is in a transmit mode and provides a second impedance based on a second impedance selection signal when the radio front end is in a receive mode such that impedance at the first winding is substantially similar in the transmit mode and in the receive mode."

Similarly, the Candal reference also fails to add to the teachings of the MacNally reference. The Candal reference discloses an antenna for a cellular telephone that may be moved from an *extended to a retracted position*. Paragraph 25 of the Candal reference states:

> "The RF signals are coupled to the antenna structure 142 at an RF signal interface that includes an impedance matching network 134. Impedance matching network 134 is designed to optimize the RF performance of the antenna structure over one or more RF bands in which the cellular phone 100 operates by maximizing the amount of RF energy that is transferred to and from the antenna structure 142. The design of the impedance matching networks in the exemplary embodiments of the present invention is simplified by the operation of the antenna structure 142, which operates to provide substantially similar impedance at the RF signal interface ***when the antenna is in both its retracted and extended positions*** [emphasis added]."

Further, as stated in paragraphs 35 and 36 of the Candal reference, the similar impedance at the RF signal interface is provided by different circuits due to different contact points of the RF signal interface in the retracted and extended positions of the antenna:

> "[0035] As described above, the impedance of the moveable antenna structure 142 is influenced by different components depending upon the position of the movable antenna element 124. When the moveable antenna element 124 is in the retracted position, the meander line element 118 is part of the RF circuit for the moveable antenna structure 142 and the radiation element 122 is not part of that RF circuit. When the moveable antenna structure 124 is moved to its extended position, the radiation element 122 is part of the RF circuit of the moveable antenna structure 142 and the meander line element 118 is not. The designs of the exemplary embodiments of the present invention, as described herein, illustrate exemplary switching techniques that are used to automatically create these different RF circuits based upon the position of the moveable antenna element. These different RF circuits, based upon the position of the moveable antenna element 124, are created in the above described embodiment by the operation of physical contact arrangements between the RF drive contact 138 and either the radiation element contact 130 or the meander line contact 106 through the conductive element 110, respectively.
>
> [0036] The meander line 118 of the exemplary embodiments is designed so as to cause the moveable antenna structure 142 to exhibit, in the one or more bands that the cellular telephone operates, an RF impedance exhibited at the RF drive connector 138 that is substantially similar when the moveable antenna element 124 is in either its extended position or its retracted position. Maintaining this similar impedance advantageously optimizes antenna efficiency and RF energy transfer between the moveable antenna structure 142 and the matching network 134 when the moveable antenna element 124 is in either position."

As such, the Candal reference discloses two different circuits connected to the RF drive connector 138 that provides substantially similar impedance when the moveable antenna element 124 is in either its extended position or its retracted position. However, the Office Action states that Candal reference teaches "a matching network configuration" and cites paragraph 23 of the Candal reference. Paragraph 23 of the Candal reference states:

> [0023] It is to be noted that, as is well known in the RF antenna arts, antennas exhibit similar characteristics when employed in receiving and transmitting functions. The RF characteristics of antennas described herein, including but not limited to impedance as exhibited at interface, etc., are equivalent for either transmit or receive operations. It is to be further understood that an RF drive point for an antenna is able to be equally considered as an RF input or output point for that antenna. It is therefore to be understood that descriptions reciting one of transmit or receive operations for antennas within this specification apply equally to the other or both receive and transmit operations.

This paragraph 23 of the Candal reference provides no description of, "an adjustable load operably coupled to a second winding of a transformer, wherein the adjustable load provides a first impedance based on a first impedance selection signal when the radio front end is in a transmit mode and provides a second impedance based on a second impedance selection signal when the radio front end is in a receive mode such that impedance at the first winding is substantially similar in the transmit mode and in the receive mode," as stated in claim 1.

Since neither reference describes this element of claim 1, the combination of the Candal reference and the MacNally reference fail to describe the element, *inter alia*, of claim 1 of, "an adjustable load operably coupled to the second winding, wherein the adjustable load provides a first impedance based on a first impedance selection signal when the radio front end is in a transmit mode and provides a second impedance based on a second impedance selection signal when the radio front end is in a receive mode such that impedance at the first winding is substantially similar in the transmit mode and in the receive mode."

<u>Combination Teaches Away from Elements of Claim 1</u>

The combination of the MacNally reference and the Candal reference teach away from the elements of claim 1. The MacNally reference states at Column 6, lines 51 through 56 that a low noise amplifier (LNA) has a first impedance transformation network, seen in Figure 2, for receiving a signal while the power amplifier has a singly matched network associated with it for transmission of a signal, as seen in Figure 12. The MacNally reference thus teaches that the power amplifier and LNA have different associated impedance networks for transmission and

reception of a signal rather than an adjustable load with a selection signal. The Candal reference teaches two different circuits connected to an RF drive connector 138 that provide substantially similar impedance to a moveable antenna element 124 in either its extended position or its retracted position. The combination thus teaches away from the claimed requirements by teaching different impedance networks and values for transmission and reception of signals and no description of an adjustable load or any type of impedance selection signal associated with an adjustable load such that impedance is substantially similar in the transmit mode and in the receive mode. Since the references teach away from the elements of claim 1, it seems that keywords in claim 1 and teachings of the specification were used to select the cited references and piecemeal together the rejection under 35 U.S.C. 103. "The court must be ever alert not to read obviousness into an invention on the basis of the applicant's own statements; that is, we must view the prior art without reading into that art appellant's teachings." *Application of Nomiya*, 184 U.S.P.Q. 607, 612 (Cust. & Pat.App. 1975). The citation of the specification's own teachings to argue obviousness over prior art is improper. *In re Dembiczak*, 175 F.3d 994, 999, (criticizing hindsight syndrome wherein that which only the inventor taught is used against the teacher).

<u>No Prima Facie Case of Obviousness for Claim 1</u>

When evaluating a claim for determining obviousness, all limitations of the claim must be evaluated. *In re Fine*, 873 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). Since the Office Action has failed to show how the combination of the MacNally reference and Candal reference teach or suggest all limitations of claim 1, a prima facie case of obviousness has not been made against claim 1.

7.2 Dependent Claim 6

Dependent claim 6 states, "determining the load impedance selection signal based on at least one of: impedance matching of load on single-ending winding, output power requirements, and receiver sensitivity." With respect to claim 6, the Final Office Action states on page 3 last paragraph that:

> "As per claims 6 and 21, the modified communication apparatus of MacNally et al. and Candal. further disclose determining the load impedance selection signal

based on at least one of impedance matching of load on single-ending winding, output power requirements, or receiver sensitivity (see MacNally et al., col. 6/ln. 48-col. 7/ln. 57)."

The Final Office Action provides no other citations or reasoning as to why the combination suggests the elements of claim 6. The citation at column 6, line 48 to column 7, line 57 of the MacNally reference includes a description of a low noise amplifier 138 and power amplifier 140 in Figure 2 of the MacNally reference and a mixer in Figure 3. MacNally describes at Column 6, lines 51 through 56 that the low noise amplifier (LNA) has a first impedance transformation network, seen in Figure 2, for receiving a signal while the power amplifier has a singly matched network associated with it for transmission of a signal, as seen in Figure 12. There is no description of a load impedance selection signal for an adjustable load. Without further citations or reasoning, the Final Office Action has failed to provide a prima facie case of obviousness of claim 6.

7.3 Independent Claim 16

The Office Action has failed to provide a prima facie case of obviousness for independent claim 16 because it has not shown that the cited references disclose or suggest the element, *inter alia*, of claim 16 of, "a radio front end includes . . . an adjustable load operably coupled to the second winding, wherein the adjustable load provides a first impedance based on a first impedance selection signal when the radio front end is in a transmit mode and provides a second impedance based on a second impedance selection signal when the radio front end is in a receive mode such that impedance at the first winding is substantially similar in the transmit mode and in the receive mode."

The combination of the MacNally reference and the Candal reference fail to disclose the elements of claim 16. With respect to the MacNally reference, the Office Action cites Figure 1 and column 5, lines 3 through 23 as disclosing, "a transformer having a first winding and a second winding, wherein the first winding is operable coupled to an antenna and the second winding coupled to at least one of a power amplifier and a low noise amplifier, and an adjustable load operable coupled to the second winding." However, the MacNally reference nowhere discloses ***an adjustable load*** coupled to a second winding of a transformer or ***any type of***

impedance selection signal. Figure 1 of the MacNally reference cited by the Final Office Aciton includes an Antenna Interface that shows a "Match" block with generic symbols for an inductor and a capacitor. The MacNally reference describes the Antenna Interface at column at Column 5, lines 11 through 14 and states that the "Antenna Interface" in Figure 1 includes, "an ISM band filter 112, a balun 114, an RF matching network 116 . . .". This description and the "Match" block in Figure 1 fail to describe ***an adjustable load*** coupled to a second winding of a transformer or ***any type of impedance selection signal***.

Similarly, the Candal reference also fails to add to the teachings of the MacNally reference. The Candal reference discloses an antenna for a cellular telephone that may be moved from an *extended to a retracted position, as stated in p*aragraph 25 of the Candal reference. Further, as stated in paragraphs 35 and 36 of the Candal reference, the similar impedance at the RF signal interface is provided by different circuits due to different contact points of the RF signal interface in the retracted and extended positions of the antenna. The Candal reference thus discloses two different circuits connected to the RF drive connector 138 that provides substantially similar impedance when the moveable antenna element 124 is in either its extended position or its retracted position. However, the Office Action states that Candal reference teaches "a matching network configuration" and cites paragraph 23 of the Candal reference. Paragraph 23 of the Candal reference states:

> [0023] It is to be noted that, as is well known in the RF antenna arts, antennas exhibit similar characteristics when employed in receiving and transmitting functions. The RF characteristics of antennas described herein, including but not limited to impedance as exhibited at interface, etc., are equivalent for either transmit or receive operations. It is to be further understood that an RF drive point for an antenna is able to be equally considered as an RF input or output point for that antenna. It is therefore to be understood that descriptions reciting one of transmit or receive operations for antennas within this specification apply equally to the other or both receive and transmit operations.

This paragraph 23 of the Candal reference provides no description of, "an adjustable load operably coupled to a second winding of a transformer, wherein the adjustable load provides a

first impedance based on a first impedance selection signal when the radio front end is in a transmit mode and provides a second impedance based on a second impedance selection signal when the radio front end is in a receive mode such that impedance at the first winding is substantially similar in the transmit mode and in the receive mode," as stated in claim 16.

Since neither reference describes this element of claim 16, the combination of the Candal reference and the MacNally reference fail to describe the element, *inter alia*, of claim 16 of, "an adjustable load operably coupled to the second winding, wherein the adjustable load provides a first impedance based on a first impedance selection signal when the radio front end is in a transmit mode and provides a second impedance based on a second impedance selection signal when the radio front end is in a receive mode such that impedance at the first winding is substantially similar in the transmit mode and in the receive mode."

Combination Teaches Away from Elements of Claim 16

The combination of the MacNally reference and the Candal reference teach away from the elements of claim 16. The MacNally reference states at Column 6, lines 51 through 56 that a low noise amplifier (LNA) has a first impedance transformation network, seen in Figure 2, for receiving a signal while the power amplifier has a singly matched network associated with it for transmission of a signal, as seen in Figure 12. The MacNally reference thus teaches that the power amplifier and LNA have different associated impedance networks for transmission and reception of a signal rather than an adjustable load with a selection signal. The Candal reference teaches two different circuits connected to an RF drive connector 138 that provide substantially similar impedance to a moveable antenna element 124 in either its extended position or its retracted position. The combination thus teaches away from the claimed requirements by teaching different impedance networks and values for transmission and reception of signals and no description of an adjustable load or any type of impedance selection signal associated with an adjustable load such that impedance is substantially similar in the transmit mode and in the receive mode.

No Prima Facie Case of Obviousness for Claim 16

When evaluating a claim for determining obviousness, all limitations of the claim must be evaluated. *In re Fine*, 873 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). Since the Office Action has failed to show how the combination of the MacNally reference and Candal reference

teach or suggest all limitations of claim 16, a prima facie case of obviousness has not been made against claim 16.

7.4 Dependent Claim 21

Dependent claim 21 states, "determining the load impedance selection signal based on at least one of: impedance matching of load on single-ending winding, output power requirements, and receiver sensitivity." With respect to claim 21, the Final Office Action states on page 3 last paragraph that:

> "As per claims 6 and 21, the modified communication apparatus of MacNally et al. and Candal. further disclose determining the load impedance selection signal based on at least one of impedance matching of load on single-ending winding, output power requirements, or receiver sensitivity (see MacNally et al., col. 6/ln. 48-col. 7/ln. 57)."

The Final Office Action provides no other citations or reasoning as to why the combination suggests the elements of claim 21. The citation at column 6, line 48 to column 7, line 57 of the MacNally reference includes a description of a low noise amplifier 138 and power amplifier 140 in Figure 2 of the MacNally reference and a mixer in Figure 3. MacNally describes at Column 6, lines 51 through 56 that the low noise amplifier (LNA) has a first impedance transformation network, seen in Figure 2, for receiving a signal while the power amplifier has a singly matched network associated with it for transmission of a signal, as seen in Figure 12. There is no description of a load impedance selection signal for an adjustable load. Without further citations or reasoning, the Final Office Action has failed to provide a prima facie case of obviousness of claim 21.

8. Claims Appendix

1 (Original). A radio front end comprises:

a transformer having a first winding and a second winding, wherein the first winding is operably coupled to an antenna and the second winding coupled to at least one of a power amplifier and a low noise amplifier; and

an adjustable load operably coupled to the second winding, wherein the adjustable load provides a first impedance based on a first impedance selection signal when the radio front end is in a transmit mode and provides a second impedance based on a second impedance selection signal when the radio front end is in a receive mode such that impedance at the first winding is substantially similar in the transmit mode and in the receive mode.

2 (Original). The radio front end of claim 1, wherein the adjustable load comprises:

a first variable capacitor circuit operably coupled from one node of the second winding to a circuit ground, wherein the first variable capacitor circuit provides a first capacitance value in response to the first impedance selection signal and provides a second capacitance value in response to the second impedance selection signal; and

a second variable capacitor circuit operably coupled from another node of the second winding to the circuit ground, wherein the second variable capacitor circuit provides the first capacitance value in response to the first impedance selection signal and provides the second capacitance value in response to the second impedance selection signal.

3 (Withdrawn). The radio front end of claim 1, wherein the adjustable load comprises:

a variable capacitor circuit operably coupled from a first node of the second winding to a second node of the second winding, wherein the variable capacitor circuit provides a first capacitance value in response to the first impedance selection signal and provides a second capacitance value in response to the second impedance selection signal.

4 (Withdrawn). The radio front end of claim 1, wherein the adjustable load comprises:

a first variable inductor circuit operably coupled in series with one node of the second winding, wherein the first variable inductor circuit provides a first inductance value in response to the first impedance selection signal and provides a second inductance value in response to the second impedance selection signal; and

a second variable inductor circuit operably coupled in series with another node of the second winding, wherein the second variable inductor circuit provides the first inductance value in response to the first impedance selection signal and provides the second inductance value in response to the second impedance selection signal.

5 (Withdrawn). The radio front end of claim 1, wherein the adjustable load comprises:

a first variable inductance circuit operably coupled from one node of the second winding to a circuit ground, wherein the first variable inductance circuit provides a first inductance value in response to the first impedance selection signal and provides a second inductance value in response to the second impedance selection signal; and

a second variable inductor circuit operably coupled from another node of the second winding to the circuit ground, wherein the second variable inductor circuit provides the first inductance value in response to the first impedance selection signal and provides the second inductance value in response to the second impedance selection signal.

6 (Original). The radio front end of claim 1 further comprises:

determining the load impedance selection signal based on at least one of: impedance matching of load on single-ending winding, output power requirements, and receiver sensitivity.

7 (Withdrawn). The radio front end of claim 1 further comprises:

the second winding of the transformer includes a first set of taps and a second set of taps, wherein the first set of taps is coupled to a low noise amplifier and the second set of taps is coupled to a power amplifier; and

wherein the adjustable load includes:

a first adjustable load circuit operably coupled to one tap of the first set of taps, wherein the first adjustable load circuit provides a first portion of the first impedance in response to the first impedance selection signal and provides a first portion of the second impedance in response to the second impedance selection signal;

a second adjustable load circuit operably coupled to a second tap of the first set of taps, wherein the second adjustable load circuit provides a second portion of the first impedance in response to the first impedance selection signal and provides a second portion of the second impedance in response to the second impedance selection signal;

a third adjustable load circuit operably coupled to one tap of the second set of taps, wherein the third adjustable load circuit provides a third portion of the first impedance in response to the first impedance selection signal and provides a third portion of the second impedance in response to the second impedance selection signal; and

a fourth adjustable load circuit operably coupled to a second tap of the second set of taps, wherein the fourth adjustable load circuit provides a fourth portion of the first impedance in response to the first impedance selection signal and provides a fourth portion of the second impedance in response to the second impedance selection signal.

8 (Withdrawn). The radio front end of claim 1 further comprises:

a second adjustable load coupled to the first winding, wherein the second adjustable load provides a third impedance in response to the first impedance selection signal and provides a fourth impedance in response to the second impedance selection signal.

9 (Withdrawn). A radio front end comprises:

a transformer having a first winding and a second winding, wherein the first winding is operably coupled to an antenna and the second winding coupled to at least one of a power amplifier and a low noise amplifier; and

an adjustable load operably coupled to the first winding, wherein the adjustable load provides a first impedance based on a first impedance selection signal when the radio front end is in a transmit mode and provides a second impedance based on a second impedance selection signal when the radio front end is in a receive mode such that impedance at the first winding is substantially similar in the transmit mode and in the receive mode.

10 (Withdrawn). The radio front end of claim 9, wherein the adjustable load comprises:

a variable capacitor circuit operably coupled from a first node of the first winding to a second node of the first winding, wherein the variable capacitor circuit provides a first capacitance value in response to the first impedance selection signal and provides a second capacitance value in response to the second impedance selection signal

11 (Withdrawn). The radio front end of claim 9, wherein the adjustable load comprises:

a variable inductor circuit operably coupled in series with one node of the first winding, wherein the variable inductor circuit provides a first inductance value in response to the first impedance selection signal and provides a second inductance value in response to the second impedance selection signal.

12 (Withdrawn). The radio front end of claim 9, wherein the adjustable load comprises:

a variable inductance circuit operably coupled from one node of the first winding to a circuit ground, wherein the variable inductance circuit provides a first inductance value in response to the first impedance selection signal and provides a second inductance value in response to the second impedance selection signal.

13 (Withdrawn). The radio front end of claim 9 further comprises:

determining the load impedance selection signal based on at least one of: impedance matching of load on single-ending winding, output power requirements, and receiver sensitivity.

14 (Withdrawn). The radio front end of claim 9 further comprises:

the second winding of the transformer includes a first set of taps and a second set of taps, wherein the first set of taps is coupled to a low noise amplifier and the second set of taps is coupled to a power amplifier;

a first adjustable load circuit operably coupled to one tap of the first set of taps, wherein the first adjustable load circuit provides a first portion of a third impedance in response to the first impedance selection signal and provides a first portion of a fourth impedance in response to the second impedance selection signal;

a second adjustable load circuit operably coupled to a second tap of the first set of taps, wherein the second adjustable load circuit provides a second portion of the third impedance in response to the first impedance selection signal and provides a second portion of the fourth impedance in response to the second impedance selection signal;

a third adjustable load circuit operably coupled to one tap of the second set of taps, wherein the third adjustable load circuit provides a third portion of the third impedance in response to the first impedance selection signal and provides a third portion of the fourth impedance in response to the second impedance selection signal; and

a fourth adjustable load circuit operably coupled to a second tap of the second set of taps, wherein the fourth adjustable load circuit provides a fourth portion of the third impedance in response to the first impedance selection signal and provides a fourth portion of the fourth impedance in response to the second impedance selection signal.

15 (Withdrawn). The radio front end of claim 9 further comprises:

a second adjustable load coupled to the second winding, wherein the second adjustable load provides a third impedance in response to the first impedance selection signal and provides a fourth impedance in response to the second impedance selection signal.

16 (Original). A radio frequency integrated circuit (RFIC) comprises:

a radio front end operably coupled to transceiver radio frequency (RF) signals;

a low noise amplifier operably coupled to the radio front end, wherein the low noise amplifier receives inbound RF signals from the radio front end, and wherein the low noise amplifier amplifies the inbound RF signals to produce amplified inbound RF signals;

down conversion module operably coupled to convert the amplified inbound RF signals into inbound baseband signals;

baseband processing module operably coupled to convert the inbound baseband signals into inbound data and to convert outbound data into outbound baseband signals in accordance with a wireless communications protocol;

up conversion module operably coupled to convert the outbound baseband signals into outbound RF signals; and

a power amplifier operably coupled to amplify the outbound RF signals to produce amplified outbound RF signals and to provide the amplified outbound RF signals to the radio front end, wherein the radio front end includes:

a transformer having a first winding and a second winding, wherein the first winding is operably coupled to an antenna and the second winding coupled to at least one of a power amplifier and a low noise amplifier; and

an adjustable load operably coupled to the second winding, wherein the adjustable load provides a first impedance based on a first impedance selection signal when the radio front end is in a transmit mode and provides a second impedance based on a second impedance selection signal when the radio front end is in a receive mode such that impedance at the first winding is substantially similar in the transmit mode and in the receive mode.

17 (Original). The RFIC of claim 16, wherein the adjustable load comprises:

a first variable capacitor circuit operably coupled from one node of the second winding to a circuit ground, wherein the first variable capacitor circuit provides a first capacitance value in response to the first impedance selection signal and provides a second capacitance value in response to the second impedance selection signal; and

a second variable capacitor circuit operably coupled from another node of the second winding to the circuit ground, wherein the second variable capacitor circuit provides the first capacitance value in response to the first impedance selection signal and provides the second capacitance value in response to the second impedance selection signal.

18 (Withdrawn). The RFIC of claim 16, wherein the adjustable load comprises:

a variable capacitor circuit operably coupled from a first node of the second winding to a second node of the second winding, wherein the variable capacitor circuit provides a first capacitance value in response to the first impedance selection signal and provides a second capacitance value in response to the second impedance selection signal

19 (Withdrawn). The RFIC of claim 16, wherein the adjustable load comprises:

a first variable inductor circuit operably coupled in series with one node of the second winding, wherein the first variable inductor circuit provides a first inductance value in response to the first impedance selection signal and provides a second inductance value in response to the second impedance selection signal; and

a second variable inductor circuit operably coupled in series with another node of the second winding, wherein the second variable inductor circuit provides the first inductance value in response to the first impedance selection signal and provides the second inductance value in response to the second impedance selection signal.

20 (Withdrawn). The RFIC of claim 16, wherein the adjustable load comprises:

a first variable inductance circuit operably coupled from one node of the second winding to a circuit ground, wherein the first variable inductance circuit provides a first inductance value in response to the first impedance selection signal and provides a second inductance value in response to the second impedance selection signal; and

a second variable inductor circuit operably coupled from another node of the second winding to the circuit ground, wherein the second variable inductor circuit provides the first inductance value in response to the first impedance selection signal and provides the second inductance value in response to the second impedance selection signal.

21 (Original). The RFIC of claim 16, wherein the radio front end further comprises:

determining the load impedance selection signal based on at least one of: impedance matching of load on single-ending winding, output power requirements, and receiver sensitivity.

22 (Withdrawn). The RFIC of claim 16, wherein the radio front end further comprises:

the second winding of the transformer includes a first set of taps and a second set of taps, wherein the first set of taps is coupled to a low noise amplifier and the second set of taps is coupled to a power amplifier; and

wherein the adjustable load includes:

a first adjustable load circuit operably coupled to one tap of the first set of taps, wherein the first adjustable load circuit provides a first portion of the first impedance in response to the first impedance selection signal and provides a first portion of the second impedance in response to the second impedance selection signal;

a second adjustable load circuit operably coupled to a second tap of the first set of taps, wherein the second adjustable load circuit provides a second portion of the first impedance in response to the first impedance selection signal and provides a second portion of the second impedance in response to the second impedance selection signal;

a third adjustable load circuit operably coupled to one tap of the second set of taps, wherein the third adjustable load circuit provides a third portion of the first impedance in response to the first impedance selection signal and provides a third portion of the second impedance in response to the second impedance selection signal; and

a fourth adjustable load circuit operably coupled to a second tap of the second set of taps, wherein the fourth adjustable load circuit provides a fourth portion of the first impedance in response to the first impedance selection signal and provides a fourth portion of the second impedance in response to the second impedance selection signal.

23 (Withdrawn). The RFIC of claim 16, wherein the radio front end further comprises:

a second adjustable load coupled to the first winding, wherein the second adjustable load provides a third impedance in response to the first impedance selection signal and provides a fourth impedance in response to the second impedance selection signal.

24 (Withdrawn). A radio frequency integrated circuit (RFIC) comprises:

a radio front end operably coupled to transceiver radio frequency (RF) signals;

a low noise amplifier operably coupled to the radio front end, wherein the low noise amplifier receives inbound RF signals from the radio front end, and wherein the low noise amplifier amplifies the inbound RF signals to produce amplified inbound RF signals;

down conversion module operably coupled to convert the amplified inbound RF signals into inbound baseband signals;

baseband processing module operably coupled to convert the inbound baseband signals into inbound data and to convert outbound data into outbound baseband signals in accordance with a wireless communications protocol;

up conversion module operably coupled to convert the outbound baseband signals into outbound RF signals; and

a power amplifier operably coupled to amplify the outbound RF signals to produce amplified outbound RF signals and to provide the amplified outbound RF signals to the radio front end, wherein the radio front end includes:

a transformer having a first winding and a second winding, wherein the first winding is operably coupled to an antenna and the second winding coupled to at least one of a power amplifier and a low noise amplifier; and

an adjustable load operably coupled to the first winding, wherein the adjustable load provides a first impedance based on a first impedance selection signal when the radio front end is in a transmit mode and provides a second impedance based on a second impedance selection signal when the radio front end is in a receive mode such that impedance at the first winding is substantially similar in the transmit mode and in the receive mode.

25 (Withdrawn). The RFIC of claim 24, wherein the adjustable load comprises:

a variable capacitor circuit operably coupled from a first node of the first winding to a second node of the first winding, wherein the variable capacitor circuit provides a first capacitance value in response to the first impedance selection signal and provides a second capacitance value in response to the second impedance selection signal.

26 (Withdrawn). The RFIC of claim 24, wherein the adjustable load comprises:

a variable inductor circuit operably coupled in series with one node of the first winding, wherein the variable inductor circuit provides a first inductance value in response to the first impedance selection signal and provides a second inductance value in response to the second impedance selection signal.

27 (Withdrawn). The RFIC of claim 24, wherein the adjustable load comprises:

a variable inductance circuit operably coupled from one node of the first winding to a circuit ground, wherein the variable inductance circuit provides a first inductance value in

response to the first impedance selection signal and provides a second inductance value in response to the second impedance selection signal.

28 (Withdrawn). The RFIC of claim 24, wherein the radio front end further comprises:

determining the load impedance selection signal based on at least one of: impedance matching of load on single-ending winding, output power requirements, and receiver sensitivity.

29 (Withdrawn). The RFIC of claim 24, wherein the radio front end further comprises:

the second winding of the transformer includes a first set of taps and a second set of taps, wherein the first set of taps is coupled to a low noise amplifier and the second set of taps is coupled to a power amplifier;

a first adjustable load circuit operably coupled to one tap of the first set of taps, wherein the first adjustable load circuit provides a first portion of a third impedance in response to the first impedance selection signal and provides a first portion of a fourth impedance in response to the second impedance selection signal;

a second adjustable load circuit operably coupled to a second tap of the first set of taps, wherein the second adjustable load circuit provides a second portion of the third impedance in response to the first impedance selection signal and provides a second portion of the fourth impedance in response to the second impedance selection signal;

a third adjustable load circuit operably coupled to one tap of the second set of taps, wherein the third adjustable load circuit provides a third portion of the third impedance in response to the first impedance selection signal and provides a third portion of the fourth impedance in response to the second impedance selection signal; and

a fourth adjustable load circuit operably coupled to a second tap of the second set of taps, wherein the fourth adjustable load circuit provides a fourth portion of the third impedance in response to the first impedance selection signal and provides a fourth portion of the fourth impedance in response to the second impedance selection signal.

30 (Withdrawn). The RFIC of claim 24, wherein the radio front end further comprises:

a second adjustable load coupled to the second winding, wherein the second adjustable load provides a third impedance in response to the first impedance selection signal and provides a fourth impedance in response to the second impedance selection signal.

9. Evidence Appendix

None.

10. Related Proceedings Appendix

None.

For the above reasons, the rejection of the claims should be withdrawn and full allowance granted. Please contact Jessica Smith at (972) 240-5324 with any questions or comments regarding this Appeal Brief.

Respectfully submitted,

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